

# Shreyas Bakare

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## Education

### Indian Institute of Science Education and Research (IISER)

BS-MS Dual Degree [physics majors]

Pune, India

Sept. 2020 - Jun. 2025

## Fellowship

### Innovation in Science Pursuit for Inspired Research (INSPIRE)

Dept. of Science and Technology (DST),

Govt. of India

- Received scholarship of INR 4,00,000 (INR 80,000 per annum)

Sept. 2020 - Jun. 2025

## Research Experience

### Search for new phenomena in 4 lepton final states with the full Run 2 dataset at ATLAS detector at LHC, CERN

IISER Pune

Supervisor : Prof. Aurelio Juste Rozas [IFAE, Barcelona]

Aug. 2023 - Present

### Characterization of a simple particle detector using cosmic particles

CERN, Geneva, Switzerland

Supervisor : Dr. Sune Jakobsen

August 2023

- Discussed the detector parts like Scintillators, Wavelength Shifters and Photodetectors at CERN summer workshop.
- Determined the 1 photo-electron charge and calculated the gain of a photomultiplier.
- Measured the light yield in a scintillator coupled to a photomultiplier using a light guide and a wavelength shifter.
- Measured the quantum efficiency of a PMT in the wavelength interval 200 to 800 nm using monochromator.

### CERN Summer Student Programme 2023 : Search for new phenomena in 4 lepton final states with the full Run 2 dataset at ATLAS detector at LHC, CERN

CERN, Geneva, Switzerland

Supervisor : Prof. Aurelio Juste Rozas, Dr. Tamara Schroeder, Dr. Nazlim Agaras

May 2023 - Aug. 2023

- Generated first-ever Monte Carlo simulations of the processes involving lepton flavour violating  $Z'$ , consistent with  $\mu$  ( $g-2$ ) explanation, using MadGraph and Pythia. And compared the kinematics for various  $Z'$  masses.
- Considering their cross sections, probed the  $Z'$  mass from 10 GeV to 100 GeV and subdivided the signal based on lepton flavour and plotted the number of signal events with center of mass energy at 13 TeV.
- Presented my work at CERN Poster Session 2023, [Poster Link](#) and submitted a project report. [Report Link](#)
- Attended CERN Summer Student Lecture Program comprising over 25 topics in particle physics by world experts.
- Attended ROOT workshop, MADGraph Workshop, ATLAS Analysis Software Tutorial, CERN Openlab SSLP 2023, visited CMS detector, ATLAS detectors, CERN data centre, Synchrocyclotron and Antimater Factory.
- Received an allowance of INR 7,80,000 (CHF 8,250) for the duration at CERN.

### Measurement of charge misidentification rates at CMS detector at LHC, CERN

IISER Pune

Supervisor : Prof. Sourabh Dube.

Jan. 2023 - Apr. 2023

- Presented the paper 'Search for a third-generation leptoquark coupling to a  $\tau$  lepton and a b quark through single, pair and nonresonant production at  $\sqrt{s} = 13$  TeV.'
- Measured and plotted the charge misidentification rates for electrons and muons as functions of  $p_T$  and  $\eta$  using whole 2018 Monte Carlo sample of Drell-Yan events comprising of about 200 million events.
- Developed an algorithm to calculate the actual charge MI rates using a control region on the run 2 dataset.

### Basic data analysis at CMS detector at LHC, CERN

IISER Pune

Supervisor : Prof. Sourabh Dube.

Aug. 2022 - Jan. 2023

- Presented the paper 'Measurement of the top-quark mass in the  $t\bar{t}$  dilepton channel using full CDF Run II data set.'
- Learned about basics of Unix operating systems, and how to use Root and GitHub
- Carried out analysis of Monte Carlo simulation samples of the Drell-Yan and  $t\bar{t}$  processes.
- Conducted a study to distinguish simulations of  $t\bar{t}Z$ ,  $WZ$ ,  $ZZ$  processes using kinematic variables such as masses and taggers such as b-tagging.

### Fundamentals of Relativity and Quantum Mechanics

IISER Pune

Supervisor : Prof. Ashish Arora.

May 2022 - Aug. 2022

- Learnt about relativity and the quantisation effects in 2D quantum well & calculated the transition energy of electron for  $Al_{0.3}Ga_{0.7}As/GaAs$  junction using python to solve the finite quantum well problem in semiconductors.

## Other Relevant Experience

### YouTube

[youtube.com](#)

STEM student mentorship & Fun science activities

Since March 2021

- Scientific interviewer of Chitraang Murdia, UC Berkeley, for YouTube series 'The Unconventional Reflections' by Gramoly. The interview has over 80,000 views on YouTube. [Link](#)

## Research and Development Associate

AIC-SEED, IISER Pune

14 Trees Foundation

May 2022 - Aug. 2022

- Built fully automated mailing system using google scripting and integrated it with the database.
- Created a simplified & dynamic view of the database using Notion. Basic database management using MongoDB.
- Received summer internship scholarship of INR 50,000.

## Fingerprint based door locking system using Arduino NANO

IISER Pune

Supervisor : Prof. Shouvik Datta.

Aug. 2022 - Nov. 2022

- Built a security system using fingerprint for the door lock with the help of Arduino Nano and solenoid lock.

## Donation Management Software

IISER Pune

Cultural fest organised by Marathi Club

Jul. 2022 - Sep. 2022

- Solved the issue of donation money scam by implementing automated email receipt system by developing a Donation management software using google app script and google sheets. Leading to increase in donations by 200%.

## Skills

<b>Software</b>	MadGraph, Pythia, Root, Arduino, MS Office, DaVinci Resolve
<b>Programming</b>	C++, Python, LaTeX, GoogleScript
<b>Languages</b>	English, Hindi, Marathi, Sanskrit

## Workshops

### ROOT workshop, MADGraph workshop, ATLAS induction day

CERN Summer Student Program

2023

### Summer Mini-Course : Understanding Experimental High Energy Physics

Prof. Sourabh Dube, IISER Pune

2022

### Fundamentals of Astronomy

B. M. Birla Planetarium & Amateur Astronomy Society, Jaipur

2021

### Gravitational Wave Analysis and EM Transients

Techfest IIT Bombay

2021

### Science Enrichment Camp

Dr Homi Bhabha Research Centre, Mumbai, India

2014

## Honors & Awards

### State Rank 1, National Physics Graduate Examination (NGPE)

IISER Pune

Indian Association of Physics Teachers

Jan. 2022

### Gold medal, 24th National Children's Science Congress(NCSC)

VIIT Baramati

Dept. of Science and Technology, Govt. of India

Dec. 2016

- Awarded Gold medal for successful project & survey based report on Recycling of Thermocol using 'like dissolves like' principle at the 5 day annual session of 24th NCSC from among 8 lakh participants.

### Inspire Award : Received scholarship of INR 5,000

Kolhapur, India

Dept. of Science and Technology, Government of India

2015

### Gold Medal, Dr Homi Bhabha Young Scientist Examination

Mumbai, India.

The Mumbai Science Teachers' Assoc.

2013-2014

- Awarded Gold medal for successful project on 'Environment in day-to-day Life' from over 45,000 participants.

## Extracurricular Activity

Volunteer	<b>CERN Alumni India group</b> , Launching first ever CERN Alumni India regional group	2023-present
Writer	<b>Science Club : Helicase Magazine</b> , Writer & Animator : Two articles & an animated video	2021- 2022
Core Team	<b>TEDxIISER Pune</b> , Media Coordinator	2022- 2023
Founder	<b>AṛTHA: The Finance Club</b> , Head : Outreach, Publicity & Media Dept.	2021- 2022
Editor	<b>Drama Club</b> , Video Editor & Animator : Produced 4 short films	2021- 2022
Volunteer	<b>Marathi Club</b> , Played flute & Built Donation Management Software	2021- 2023
Quiz	<b>Rank 1 (Scholarship of INR 3,000)</b> , Championship by Dr A. P. J. Abdul Kalam Vigyan Manch	2019
NCC	<b>National Cadet Corps</b> , Attended Annual Training Camp, 3 MAH Air Squadron NCC, India	2015-2018